PERFORMING ARTS AND ADVANCED NETWORKING

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NEW WORLD SYMPHONY
About New World Symphony (NWS)

- 87 Fellowship Musicians, most post-graduate, for up to 3 years
- 100+ Concert Productions each year
- Educational programs geared towards leadership, musical excellence, professional training, community outreach and entrepreneurship
Requirements for Online Learning

- Ease of Use
- Audio/Video Quality
- Latency
- Accessibility
Ease of Use – complexity of hardware setup and software operation

Quality – the perceived quality of the solution at full capability

Latency – the time it takes from the signal to get from A to B

Accessibility – how widely the platform is used
Early Experiments (2002-2006)
DVTS (Digital Video Transport System)

- DV Specification
- Firewire and HDV Cameras
- Windows Only
DVTS – The “Good”

- Stereo, uncompressed 44.1Khz PCM audio
- Multicast enabled
- Free
DVTS – The Bad

- 200ms+ latency
- Standard Definition
- No error-correction (UDP)
- No echo-cancellation
ConferenceXP

- Originally developed by Microsoft
- Windows Only
- Utilizes Windows Media Encoder codecs
ConferenceXP – The Good

- Works with most consumer and professional devices
- Variable bandwidth allocation for audio and video
- Easy multipoint
- Security transversal possible
ConferenceXP – The Bad

- Uses antiquated compression scheme out-of-the-box
- Heavy CPU utilization
- P2P connections are buggy
- Last commit was in 2015
H.323

- Low-bandwidth
- Ubiquitous in higher education
- Commercial solution
- Secure
H.323 – The Good

- HD Resolutions
- Low bandwidth
- Error correction
- Easy Multipoint
- Onboard Echo Cancellation
H.323 – The Bad

- Best sounding codecs are proprietary
- Expensive
- Onboard Echo Cancellation
- Awkward handshaking between manufacturers
Ultragrid

- Software solution
- Developed by Czech Republic R&E network in 2002
- Used in a variety of scientific environments (and the Arts)
Ultragrid – The Good

- Uses commodity hardware
- Support for up to 8K resolution
- Excellent technical support
- Works on a variety of OS
- Latency as low as 40ms
Ultragrid – The Bad

- Command line operation is most stable
- Tricky installation depending on Operating System
- Requires a good deal of bandwidth in some cases
LOLA

- Originally released in 2011 by GARR
- Windows only
- Color or B&W video
- Growing international user group
LOLA – The Good

- Variable video resolution (480 – 1200p)
- Multi-channel audio support
- Super simple GUI
- Works with (particular) professional audio gear
LOLA – The Bad

- Requires 20 – 800Mbps
- Does not play well with firewalls
- No Multi-point (yet...)
- Requires specialized USB3 cameras
MVTP/Nimbra

- UDP based delivery systems
- Designed for professional broadcast
- Standalone devices
- Based on FPGA circuits
MVTP/Nimbra – The Good

- Capable of 4K/8K video transmission
- Multi-channel support for audio AND video
- Error correction and recovery
- Commercially supported
- Ultra low latency
MVTP/Nimbra – The Bad

- High bandwidth utilization without compression
- Requires very high-quality and consistent network connections, ideally with synchronization
- Very expensive
Ease of Use

- MVTP/Nimbra
- LOLA
- Ultragrid
- H.323
- ConferenceXP
- DVTS
Accessibility

MVTP/Nimbra
LOLA
Ultragrid
H.323
ConferenceXP
DVTS
Current Challenges

- Solutions are either too expensive, too complicated or require substantial bandwidth free of security measures.
- All solutions require some understanding of audio, video, networking and lighting in order to use for highest impact.
- The networks are slowing us down (and causing us anxiety).
- Display technology is imperfect (i.e. SLOOOOOOW).
- Physical connections still required.
The Infinite Bridge
Near in the Distance
Global Audition Training Project
What’s Next?
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